

## Answers to the Dog Translations

(Revised April 19, 2010)

1.  $\exists x(\text{Dog}(x) \wedge \forall y(\text{Dog}(y) \rightarrow x=y) \wedge \text{Happy}(x))$
2.  $\exists x(\text{Dog}(x) \wedge \text{Large}(x) \wedge \forall y((\text{Dog}(y) \wedge \text{Large}(y)) \rightarrow x=y) \wedge \text{Happy}(x))$
3. The happy dog is large.
4. The dog, which is large, is happy. (I.e. the dog is large and happy)
5.  $\exists x(\text{Dog}(x) \wedge \forall y((\text{Dog}(y) \wedge x \neq y) \rightarrow \text{Larger}(x, y)) \wedge \text{Happy}(x))$
6.  $\exists x(\text{Dog}(x) \wedge \text{Bit}(x, \text{felix}) \wedge \forall y((\text{Dog}(y) \wedge \text{Bit}(y, \text{felix}) \wedge x \neq y) \rightarrow \text{Larger}(x, y)) \wedge \text{Happy}(x))$
7.  $\exists x(\text{Dog}(x) \wedge \forall y((\text{Dog}(y) \wedge x \neq y) \rightarrow \text{Larger}(x, y)) \wedge \text{Bit}(x, \text{felix}) \wedge \text{Happy}(x))$
8.  $\exists x(\text{Dog}(x) \wedge \forall y((\text{Dog}(y) \wedge x \neq y) \rightarrow \text{Larger}(x, y)) \wedge \forall z(\text{Cat}(z) \rightarrow \text{Bit}(x, z)))$
9.  $\exists x \exists y \exists z (\text{Cat}(x) \wedge \text{Cat}(y) \wedge \text{Cat}(z) \wedge x \neq y \wedge x \neq z \wedge y \neq z)$
10. In addition to Felix, there are at least two cats. (I.e. there are at least 2 cats that aren't Felix.)
11. There are at most two happy cats.
12. There are exactly two dogs that are larger than all of the cats.
13.  $\text{Cat}(\text{felix}) \wedge \text{Bit}(\text{felix}, \text{rover}) \wedge \forall x((\text{Cat}(x) \wedge \text{Bit}(x, \text{rover})) \rightarrow x = \text{felix})$
14.  $\text{Cat}(\text{felix}) \wedge \text{Bit}(\text{felix}, \text{rover}) \wedge \forall x((\text{Cat}(x) \wedge \text{Bit}(x, \text{rover}) \wedge x \neq \text{mother}(\text{felix})) \rightarrow x = \text{felix})$
15.  $\forall x[(\text{Dog}(x) \wedge \text{Bit}(x, \text{felix})) \leftrightarrow (\text{Dog}(x) \wedge \text{Larger}(x, \text{rover}))]$